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Dr. Alex L. Shigo dissects a tree.

U.S. DEPT. OF AGRICULTURE

PHOTO STORY No. 6

WHAT'S IN A TREE?

How can you tell, by examining a growing tree's outsides, what its insides are like? One tree may be sound from pith to bark, yet be so damaged by minute discolorations that it is worthless for high-quality products. Another may be rotten at the core, yet still contain a large volume of high-quality wood. How can you tell?

Dr. Alex Shigo, plant pathologist on a pioneer research project with the Forestry Sciences Laboratory, Durham, N. H., recently cut into 3,000 trees throughout northern New England. From his studies, he found that internal patterns of discoloration and decay can be predicted from external signs. His findings provide an extensive volume of clues on how to predict the unseen insides of a living tree from what can be seen outside.

Discoloration and decay of wood are the most serious defects of northern hardwood trees. By dissecting living trees and studying organisms that infect them, Shigo has determined that discoloration and decay of wood develop in certain predictable patterns.

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NORTHEASTERN FOREST EXPERIMENT STATION • UPPER DARBY, PENNSYLVANIA 19082

Shigo also found that branch stubs are the main entry points for the agents that initiate the discoloration and decay processes. He found that various hardwoods react differently to injuries; that a tree may become discolored, yet never decay; that the column of defect will be no larger than the tree was at the time of injury.

He found that decay follows from a complex succession of events. It works roughly like this -- a tree is injured; the tree reacts; chemical changes take place in the wood; the wood discolors; bacteria and non-decay fungi become active; the wood discolors further; decay fungi infect; decay begins.

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FOMES APPLANATUS on Wound

This beech tree has a large basal wound with fruit bodies of Fomes applanatus. This indicates advanced decay, extending to base and roots. This is the principal fungus infecting the base of beech. The face of the wound is dark and rough.

Dissection shows that the decay extends from the base to 4 feet above the wound, where it ends abruptly. The central column of defect is very wide. This is due to the large wound and the infection of the tree base by F. applanatus.

FOMES CONNATUS Fruit Body and Borer Wound

The large fruit body on the face of the old basal wound on this sugar maple is Fomes Connatus. It is typically white and moist, and has green moss on top. Above it is a large open wound caused by a sugar maple borer. Borer wounds can be found on all parts of the stem. These beetles apparently are attracted to trees left after logging.

Dissection shows that the sugar maple borer attacked this tree soon after it was wounded at the base. The decay due to F. connatus is dark brown to black, and moist. Though decay is advanced, it ends a short distance above the fruit body. Another decay fungus is advancing downward from the borer wound. The diameter of the defect column indicates the diameter of the tree when it was wounded.

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Shigo's information is valuable to forest managers and economists. It will help them decide before cutting what the degree of discoloration and decay of woods and how it can best be compensated for. If a tree has minute streaks of discoloration and decay scattered throughout it, the tree might be worthless as veneer, a top value wood product. Other markets will have to be found for it. On the other hand, a tree with a rotten core surrounded by clear wood, could be quite appropriate for veneer wood.

Shigo's study showed that the important thing is not how much discoloration and decay a tree has, but where the defect that can lower the quality of the wood is located.

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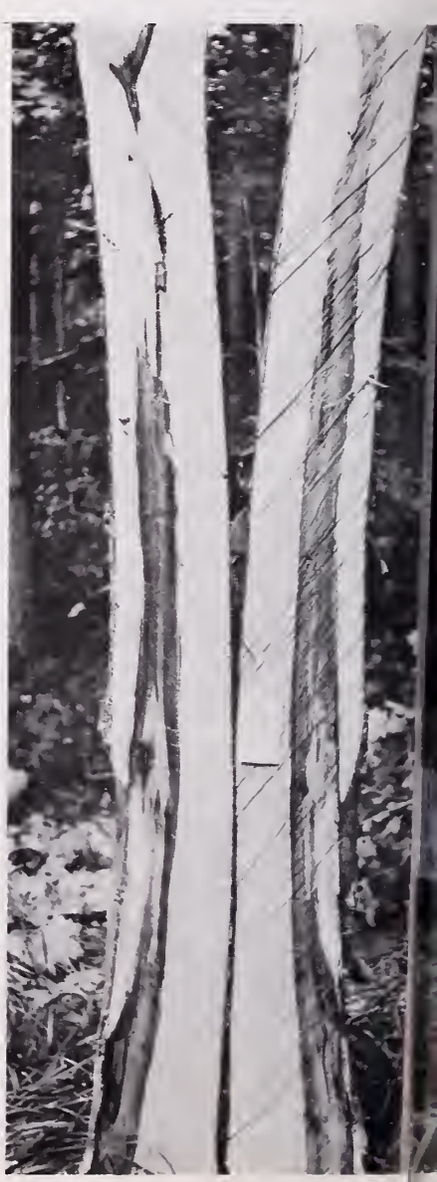
Logging Wound on Paper Birch

The 100-year-old paper birch with a 50-year-old wound extending from its base, shown in the picture at left, was dissected. The lower 8-foot section of the tree (right) has a 5-inch hollow center. This decay did not go into the new wood formed after the tree was wounded. In the 8-foot upper section of the tree (left), the advance of the decay fungus can be seen as mere dark streaks in the wood.

Rough Dark Wound



On the outside, the 8-year-old wound on the sugar maple, in the picture at right, was rough, dark, and splintered. This could be serious. When dissected, the defect area was wedge-shaped. The dark, moist column of discoloration is wetwood or blackheart. It extends up 8 feet to a branch stub. Decay is advancing up the discolored column.